Maria Z. Hakuba

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EDUCATION

Ph.D. in Environmental Sciences **2015**
ETH Zurich, Switzerland
Dissertation: *Solar absorption in the atmosphere – Improved estimates from surface and satellite observations*
Advisors: Martin Wild, Doris Folini, Christoph Schär

M.S. in Environmental Sciences **2011**
ETH Zurich, Switzerland
Major in Atmospheric and Climate Sciences, Minor in Renewable Energy technologies
Thesis: *Greenland in a changing climate – Topographic feedback on snow accumulation and large-scale circulation*
Advisors: Christoph Schär, Martin Wild, Doris Folini

B.S. in Environmental Sciences **2009**
ETH Zurich, Switzerland

PROFESSIONAL EXPERIENCE

Research Scientist **07/2020-present**
Jet Propulsion Laboratory, Pasadena
Deputy Principle Investigator for *Libera*
Research interests: global energy and sea level budgets, radiative feedbacks and controls on the hydrological cycle, satellite mission concepts to advance measurement of Earth energy uptake.
Supervisor: Jonathan Jiang; Advisor: Graeme L. Stephens

Postdoctoral Fellow **2015-2020**
Colorado State University, Ft. Collins
Affiliated with and physically located at Jet Propulsion Laboratory, Pasadena
Research interests: global and regional energy budgets, radiative controls on the hydrological cycle and large-scale circulation, study of tropical convection using GPS radio occultation measurements, satellite mission formulation.
Advisor: Graeme L. Stephens

Postdoctoral Research Assistant **2015**
ETH Zurich, Switzerland
Research on shortwave absorption and cloud effects. Evaluation of global climate models.
Advisors: Martin Wild, Doris Folini

Ph.D. candidate **2011-2015**
ETH Zurich, Switzerland
Main foci of research:
1) Spatial representativeness of surface solar radiation measurements.
2) Improved estimates and characterization of atmospheric solar absorption.
3) Retrieval of cloud effects from in-situ radiation measurements.
Advisors: Martin Wild, Doris Folini, Gabriela Schaepman-Strub

Post Diploma Research Assistant **2011**
ETH Zurich, Switzerland
Research on the topographic impact of the Greenland ice sheet on circulation and snow accumulation.
Advisors: Christoph Schär, Martin Wild, Doris Folini

Intern at Mauna Loa Observatory **2009**
NOAA GMD MLO, Hilo, Hawaii
Maintenance and operation of instruments from various programs, Research on Asian dust.
Advisor: John Barnes

Research Assistant **2008-2010**
ETH Zurich, Switzerland
Maintenance support of the Global Energy Balance Archive (GEBA).
Advisor: Martin Wild

Chief Editor Polykum **2007-2008**
VSETH, ETH Zurich, Switzerland
Editorial responsibilities for Polykum, Student Magazine at ETH Zurich
(monthly circulation: 23'000)

Editor Polykum **2006-2007**
VSETH, ETH Zurich, Switzerland
Journalist with Polykum, Student Magazine at ETH Zurich.

Volunteer **2005**
Teaching and Projects Abroad, Sri Lanka.
Tsunami relief work.

Freelance Journalist **2004-2005**
Badische Zeitung, Bad Säckingen, Germany.
Freelance journalist at a daily newspaper.

TEACHING EXPERIENCE (ETH Zurich & Caltech)

Guest lecture at Caltech **October 30, 2018**
ESE 101: Earth's Atmosphere by Prof. Tapio Schneider

Teaching Assistant **2011-2013**
Bachelor course by Prof. Christoph Schär: Numerical Methods in Environmental Science.

Teaching Assistant **2012-2014**
Master course by Prof. Martin Wild: Radiation and Climate Change

Teaching Assistant **2012-2013**
Atmospheric Physics lab: Sun photometry experiments.

REVIEWING & PANEL ACTIVITIES

Reviewer for Journal of Geophysical Research-Atmospheres, Journal of Applied Meteorology and Climatology, Journal of Climate, Remote Sensing, Remote Sensing of Environment, Current Climate Change Reports, Geophysical Research Letters, Climate Dynamics, Frontiers.
NASA ROSES, NASA FINESST, EUMETSAT CM SAF Product Consolidation Review, JPL Team X flight mission proposal reviews.

Panelist: International Radiation Comission (IRC), GCOS AOPC, GCOS task team for GCOS Surface Reference Network (GSRN), GEWEX GDAP working group on ocean heat content uncertainty, Talks Chair of JPL's New Researchers' Support Group (NRSG).

Convener: Various AGU and EGU sessions on Earth's energy balance and radiation budget. Co-organized Libera Science Team meeting 2020 and CERES-Libera Science team meeting 2021. Special collection on Earth's energy imbalnace with Journal of Climate and other AMS journals.

AWARDS AND RECOGINTIONS

JPL Outstanding Postdoctoral Research Award **2016**
Postdoctoral Scientist Program, Princeton University AOS / NOAA GFDL (declined) **2015**
Travel award to the AMS conference on Atmospheric Radiation **2014**

PUBLICATIONS

Hakuba, M.Z. et al. (in prep. for *BAMS*), Libera's shortwave sub-band measurements and their application in climate research.

Hakuba, M.Z. et al. (submitted to *GRL*), Earth's Energy Imbalance from the ocean perspective (2005 – 2019).

Stephens, G.L., J. Worden, **M.Z. Hakuba**, E. Rignot, J. Reager, P. Durack, J. Slingo (2020), Earth's water reservoirs in a changing climate, *Proceedings of the Royal Society A.*

Meyssignac, B., T. Boyer, Z. Zhao, M.Z. Hakuba, F. Landerer, D. Stammer, and others (2019), Measuring Global Ocean Heat Content to Estimate the Earth Energy Imbalance. *Frontiers in Marine Science*.

Schwartz, M., D. Folini, **M.Z. Hakuba**, M. Wild (2018), From Point to Area: Worldwide Assessment of the Representativeness of Monthly Surface Solar Radiation Records, *J. Geophys. Res.: Atmospheres*, **123**, 24, doi: 10.1029/2018JD029169.

Wild, M., **M.Z. Hakuba**, Doris Folini, Patricia Doerig-Ott, Christoph Schaer, Seiji Kato, Charles Long (2018), The cloud-free global energy balance and inferred cloud radiative effects: an assessment based on direct observations and climate models, *Climate Dynamics*, doi: 10.1007/s00382-018-4413-y.

Hakuba, M.Z., G.L. Stephens, B. Christophe, B. Foulon, S. V. Bettadpur, B. D. Tapley. F.H Webb and others (2018), Earth's Energy Imbalance measured from Space, *IEEE Transactions on Geoscience and Remote Sensing,* doi: 10.1109/TGRS.2018.2851976.

Stephens, G.L., **M.Z. Hakuba**, M. Lebsock, Q. Yue, B. Kahn, S. Hristova-Veleva, A. Rapp, C. Stubenrauch, G.S. Elsaesser, J. Slingo (2018), Regional intensification of the tropical hydrological cycle during ENSO, *Geophys. Res. Letters*, **45**, doi: 10.1029/2018GL077598.

Schwartz, M., D. Folini, **M.Z. Hakuba**, M. Wild, Spatial representativeness of surface-measured variations of downward solar radiation: Spatiotemporal representativeness of SSR, *J. Geophys. Res.: Atmospheres*, **122**, 13,319–13,337, doi: 10.1002/2017JD02726.1

Wild, M., A. Ohmura, C. Schär, G. Müller, D. Folini, M. Schwarz, **M.Z. Hakuba**, A. Sanchez-Lorezno, The Global Energy Balance Archive (GEBA) version 2017: A database for worldwide measured surface energy fluxes, *Earth System Science Data* **9**(2):601-613, doi: 10.5194/essd-9-601-2017.

Wild, M., **Hakuba, M.Z**., D. Folini, C. Schär, C.N. Long (2017), New estimates of the Earth radiation budget under cloud-free conditions and cloud radiative effects, *AIP Conference Proceedings*, 1810, doi: 10.1063/1.4975552.

Hakuba, M.Z., D. Folini, M. Wild, C.N. Long, G.L. Stephens (2017), Cloud effects on atmospheric solar absorption in light of most recent surface and satellite measurements, *AIP Conference Proceedings*, **1810**, doi: 10.1063/1.4975543.

Sanchez-Lorenzo, A., A. Enriquez-Alonso, M. Wild, J. Trentmann, S. M. Vicente-Serrano, A. Snachez-Romero, R. Posselt, **M.Z. Hakuba** (2017), Trends in downward surface solar radiation from satellites and ground observations over Europe during 1983–2010, *Remote Sensing of Environment,* **189**, doi: 10.1016/j.rse.2016.11.018.

Folini, D., T. N, Dallafior, **M.Z. Hakuba**, Wild, M. (2016), Trends of surface solar radiation in unforced CMIP5 simulations: SSR trends in unforced CMIP5 simulations, *J. Geophys. Res. Atmos.,* **122**(1), doi*:* 10.1002/2016JD025869.

Stephens, G.L., **M.Z. Hakuba**, M. Hawcroft, J. Haywood, A. Behrangi, J. E. Kay, and P. J. Webster (2016), The Curious Nature of the Hemispheric Symmetry of the Earth's Water and Energy Balances, *Current Climate Change Reports*, doi:10.1007/s40641-016-0043-9.

Hakuba, M.Z., D. Folini, and M. Wild (2016), On the zonal near constancy of fractional solar absorption in the atmosphere, *J. Climate,* **29**, 3423–3440, doi: 10.1175/JCLI-D-15-0277.1.

Sanchez-Lorenzo, A., M. Wild, M. Brunetti, J.A. Guijarro, **M.Z. Hakuba**, J. Calbó, S. Mystakidis, B. Bartok (2015), Reassessment and update of long-term trends in downward surface shortwave radiation over Europe (1939-2012), *J. Geophys. Res. Atmos.,* **120,** doi: 10.1002/2015JD023321.

Wild, M., D. Folini, **M.Z. Hakuba**, C. Schär, S. I. Seneviratne, S. Kato, D. Rutan, C. Ammann, E. F. Wood, G. König-Langlo (2014). The energy balance over land and oceans: an assessment based on direct observations and CMIP5 climate models, *Climate Dynamics*, **44**, doi:10.1007/s00382-014-2430-z.

Hakuba, M.Z., D. Folini, A. Sanchez-Lorenzo, M. Wild (2014). Spatial representativeness of ground-based solar radiation measurements – Extension to the full Meteosat disk, *J. Geophys. Res. Atmos.,* **119**, doi:10.1002/2014JD021946.

Hakuba, M.Z., D. Folini, G. Schaepman-Strub, and M. Wild (2014), Solar absorption over Europe from collocated surface and satellite observations, *J. Geophys. Res.*, **119**, doi:10.1002/2013JD021421.

Hakuba, M.Z., D. Folini, A. Sanchez-Lorenzo, M. Wild (2013). Spatial representativeness of ground-based solar radiation measurements, *J. Geophys. Res.*, **118**, doi:10.1002/jgrd.50673.

Hakuba, M.Z., A. Sanchez-Lorenzo, D. Folini, M. Wild (2013). Testing the homogeneity of short-term surface solar radiation series in Europe, *AIP Conference Proceedings*, **1531,** doi:10.1063/1.4804866.

Hakuba, M.Z., D. Folini, M. Wild, and C. Schär (2012). Impact of Greenland's topographic height on precipitation and snow accumulation in idealized simulations, *J. Geophys. Res.,* **117** (D9), doi:10.1029/2011JD017052.

ORAL PRESENTATIONS

Earth's energy imbalance measured from space **2021**
Libera weekly science team meeting, virtual

What can Sea Level Change tell us about Earth's Energy Imbalance? **2021**
COSPAR 2021, virtual

Libera – Understanding Earth's Energy Budget **2020**
AGU Fall meeting 2020, virtual

Libera Science Objectives beyond L1b **2020**
CERES Science Team Fall Meeting 2020, virtual

Libera Sceince & Data products overview **2020**
Libera Science Team Meeting 2020, virtual

Long-term variability of shortwave absorption under abrupt-4xCO2 climate forcing and its visible and near-IR contributions **2020**
EGU General Assembly, virtual

Earth's energy balance: Measurement, assessment, processes **2020**
Climate and Radiation laboratory, NASA GFSC, Greenbelt MD, US

Earth's energy balance: Measurement, assessment, processes **2020**
JPL Climate Science seminar, Pasadena, US

On the nature of tropical "EEI" variability **2020**
CloudSat Science team meeting, Boulder, US

On the breathing of the tropical troposphere and its relation to the topical energy balance **2019**
EGU General Assembly, Vienna, Austria

Can we derive Earth's energy imbalance from Sun and Earth's radiation pressure acting on spherical LEO satellites? **2018**
WCRP workshop: The Earth's Energy Imbalance and its implications (EEI), Toulouse, France

On the Measurement of Earth's Energy Imbalance **2018**
AMS conference in Atmospheric Radiation, Vancouver, Canada

On the Direct Measurement of Earth's Energy Imbalance **2018**
Research Seminar, Center for Climate Sciences, JPL, Pasadena

Can we measure Earth's energy imbalance directly from space? **2018**
EGU General Assembly, Vienna, Austria

How well can we measure Earth's Energy Imbalance? **2017**
AGU Fall meeting, San Francisco

Dynamically driven super C-C intensification of the tropical hydrological cycle **2017**

EGU General Assembly, Vienna, Austria

Hemispheric Energy Balance from an Ocean Perspective **2016**
AGU Fall meeting, San Francisco

Hemispheric Energy Balance from an Ocean Perspective **2016**
Radiation Budget workshop, ECMWF, Reading, UK

Hemispheric Energy Balance from an Ocean Perspective **2016**
Postdoc Research Day Awards Ceremony, JPL, Pasadena

Hemispheric Surface Heat Budget from an Ocean Perspective **2016**
Research Seminar, Center for Climate Sciences, JPL, Pasadena

Cloud Effects on Atmospheric Solar Absorption in Light of Most Recent Surface and Satellite Measurements **2016**
International Radiation Symposium, Auckland, New Zealand.

On the zonal near constancy of fractional atmospheric solar absorption **2016**
International Radiation Symposium, Auckland, New Zealand.

Cloud Effects on Atmospheric Solar Absorption in Light of Most Recent Surface, Satellite, and GCM Datasets **2015**
AGU Fall meeting, San Francisco

Absorption of solar radiation in the clear and cloudy skies **2015**
IUGG General Assembly, Prague, Czech Republic.

Solar absorption in the clear and cloudy skies **2015**
EGU General Assembly, Vienna, Austria.

Solar absorption in the atmosphere - Improved estimates from surface and satellite observations **2014**
PhD defense, ETH Zurich, Switzerland

Solar absorption and cloud radiative effects observed at BSRN sites **2014**
13th BSRN Scientific Review and Workshop, Bologna, Italy.

Solar absorption in the atmosphere – Estimates from collocated surface and satellite observations **2014**
Seminar talk at NOAA GFDL Princeton, NASA JPL Pasadena, UCSD Scripps La Jolla, NOAA Boulder, NCAR Boulder.

Solar absorption in the atmosphere – Estimates from collocated surface and space-born observations **2014**
AMS conference on Atmospheric Radiation, Boston.

Solar absorption in the atmosphere – Estimates from collocated surface and satellite observations over Europe **2014**
EGU General Assembly, Vienna, Austria.

Absorption of solar radiation – Towards estimates from ground-based solar radiation measurements and collocated satellite products **2013**
EGU General Assembly, Vienna, Austria.

Disposition of solar energy – Towards estimates from BSRN measurements and collocated satellite products in Europe **2012**
12th BSRN Scientific Review and Workshop, Potsdam, Germany.